REMARKS/ARGUMENTS

Claims 1, 2, 6-10, and 12-20 remain in this application. Claim 1 is hereby amended. Claims 3-5 and 11 have been cancelled. Claims 3 – 5, 11, and 21 – 37 were previously cancelled.

1. Drawings

The Examiner previously indicated on the October 28, 2003 form PTOL-326 that the formal drawings previously submitted had been approved.

2. § 103 Rejections

The Examiner has rejected claims 1, 8, 9/1, 9/8, 12, and 13 under 35 U.S.C. § 103(a) as being unpatentable for over Danner (1,674,856) in view of Anderson (6,196,026). The Applicant respectfully submits that, as explained below, claim 1 as presently amended, and therefore all of the remaining claims that depend from claim 1, would not have been obvious to one of ordinary skill in the art in view of Danner and Anderson at the time the present invention was made.

Claim is hereby amended to more clearly claim the present invention. Claim 1 as presently amended claims:

"A method of producing sheets of glass having two faces (F_1, F_2) with at least one of said faces (F_1) presenting a high surface quality in a fusion down draw process, the method comprising:

a) **fusion forming a stream of glass (1a), said stream of glass (1a) falling downward and having** a first and second face (s_1, s_2), each face is free from making contact with any surface, and **a viscosity in the range of about 10 Pa.s to about 1000 Pa.s (100 poises to 10,000 poises) and thus possibly being destabilized mechanically**;

b) delivering said stream of glass (1a) prior to destabilization to a treatment device or mechanism (4a);

c) **treating said delivered stream of glass** (1a) prior to destabilization by putting a first face (s_2) into contact **with a substantially smooth surface of a treatment device or mechanism** (4a) that supports the weight of said glass and accompanies the falling movement of said glass while **increasing the glass viscosity**

sufficiently for the glass to continue to fall downward without destabilizing mechanically, and maintaining at least a central strip of said second face (s_1) free from any contact with any surface;

d) releasing said treated stream of glass (1a') from said treatment device or mechanism (4a), said treated stream of glass falling (1a') downward from said treatment device or mechanism with at lease said second face (s_1) being free from making contact with any surface;

e) **contacting the outer edges of said treated stream of glass with a device or mechanism (7, 8) that** controls the speed, and **adjusts the width or thickness of the treated stream of glass** (1a) downstream of the treatment device or mechanism; and

f) cooling said treated stream of glass to produce a sheet of glass.

The Examiner stands by his previous assertion that Danner teaches a method of producing sheets of glass wherein;

1. The sheet of glass has two faces, face (F1) and face (F2) **wherein one side of said sheet (F1) presents a "hardened skin surface which will prevent it becoming marred"**. (Emphasis added)

2. A stream of glass (1a) delivered which has a first face (s2) and a second face (s1), and each face is free from making contact with any surface as evidenced in the region of the s1 and s2 lead lines.

3. The first face (s2) is placed into contact with a treatment device (4a) while maintaining at least a central strip of the second face (s1) free from any contact with any surface….. …..Further, while the glass is in contact with the "treatment device or mechanism (4a)" the second face (s1) of the glass sheet (1a) is cooled by an air blast nozzle. Since the inverse relationship between glass temperature and viscosity is well established and the "treatment device or mechanism (4a)" cooperates in the cooling of the glass sheet", said device increases the viscosity of the glass sheet. The "treatment device or mechanism (4a)" is therefore understood to both accompany "the falling of said glass while increasing glass viscosity" as claimed.

4. **A device or mechanism for <u>controlling glass travel speed, width, and thickness</u> acts upon the treated stream** (1a') (pg 3, Lines 7-8). (Emphasis added).

The present invention is directed to a method of forming low viscosity glasses, in which the glass sheet is fusion formed and drawn. In such a fusion draw process, the stream of fused melted glass falls down through the air without making contact with any surface, in order to form glass sheets having a high surface quality (e.g. highly smooth) that is not achievable via other processes without subsequent polishing steps. As the glass stream/sheet falls through the air and cools, but is still workable, it is acted upon (e.g. drawn) to further control its speed, and to adjust its width and thickness, in order to thin and/or widen the stream glass before it hardens into a sheet of glass. When attempting to fusion draw glass sheets having a low viscosity, the unsupported falling low viscosity molten glass sheet tends to become unstable and may fall apart when being drawn, or even under its own weight, prior to hardening. The resulting drools or wavy sheets of glass are unusable.

The present invention, as claimed in claim 1 as presently amended, solves this problem by temporarily supporting the fusion formed low viscosity stream of glass, in order to support the stream of glass and treat the stream of glass to raise its viscosity to the point that it can support its own weight and be drawn without becoming mechanically destabilized. The treated stream of glass is still soft and workable enough for widening and/or and thinning of the glass sheet to the desired dimensions that are not achievable without such widening and/or and thinning.

The Applicant respectfully submits that Danner and Anderson do not teach or suggest a fusion draw process that acts on the stream of glass or uses a device or mechanism (7, 8) to **control the speed, and adjust the width and thickness of the treated stream of glass (1a) downstream of the treatment device or mechanism**" as recited in claim 1 as presently amended. On page 3 lines 7-8, Danner (as indicted by the Examiner) merely teaches the sheet as "passing between a pair of rollers 23 which **may act on the sheet to either support or feed the same.**" (Emphasis added) It is respectfully submitted that "supporting" and "feeding" in this context is none

controlling the speed, or adjusting the width and thickness of the treated stream, but is merely maintenance of the stability and direction of travel of the glass sheet (supports and feeds). In as much as "feed" may be interpreted as controlling the speed, Danner would still fail to teach or suggest adjusting the width or thickness of the treated stream as presently claimed in claim 1.

It is further submitted that it is impossible to act on the stream of glass in a manner that controls the speed, and adjusts the width or thickness of the stream of glass downstream of the treatment device taught by Danner. As pointed out by the Examiner ("wherein one side of said sheet **(F1) presents a "hardened skin surface which will prevent it becoming marred"**) one face of the stream of glass in the Danner device is cooled and substantially hardened by an air blast nozzle that presses the stream of glass against the impression roll 10. (See Danner Page 2, lines 82-96):

> "The air-blast against the soft sheet not only serves to effectually press the sheet against the roll......, **but also tends to quickly cool the outer side of the sheet and give it a glazed formation** so that it will not be marred by coming in contact with a deflecting agent..."; "...the **outer chilled or substantially hardened portion of the sheet.**"). (Emphasis added)

It is submitted that cooling a surface of a glass sheet to the point that the cooled surface is substantially hardened and glazed would increase its viscosity and stiffen the cooled side of the glass sheet past the working point, such that the glass sheet could no longer be worked on downstream of the impression role to widen or thin the glass as currently claimed in claim 1 without splitting or cracking the glazed surface of the glass sheet. Attempting to act on such a hardened glass sheet/stream to adjust its width and thickness downstream of the impression roll taught by Danner would unacceptably fracture the substantially hardened or glazed surface of the sheet/stream of glass and/or cause the glass sheet to warp due the uneven contraction and thermal stresses created in the glass sheet by the differential cooling of opposite sides of the sheet. Since the fused sheet taught by Danner is cooled and substantially hardened on one side, it is submitted that it cannot be further treated as is presently claimed and that the process taught by Danner is clearly not a "fusion draw" process as presently claimed in claim 1. As such,

it is respectfully submitted that Danner teaches away from the fusion draw process as presently claimed in all of the presently pending claims.

The Examiner argues that the bending of the glass sheet in the Danner process downstream of the treatment device indicates that the viscosity of the glass sheet is in the working range downstream of the treatment device, and therefore cannot be hardened on one side at the treatment device beyond its ability to be stretched as argued by the Applicant. However, the hardening of one surface of the glass sheet by Danner at the treatment device beyond the point of being able to be subsequently stretch, is entirely consistent with the ability of a glass ribbon to be subsequently bent as shown in Danner. Glass bending in viscous/visco-elastic state is "relatively easy" to obtain and can be obtained at viscosities as high as 10^7 poises. However, it is well known that practically no appreciable stretching can be obtained at such a high viscosities. Glass ribbon stretching is typically performed at viscosities of about 10^6 poises.

Anderson, on the other hand, immediately lays a slot drawn (not fusion drawn) ribbon of glass onto the mold cavity 70, 74 and then suctions the glass into the mold cavities. Anderson also does not teach the thinning or widening of a stream of glass as is presently claimed. Even if Anderson did teach such a downstream treatment of the sheet of glass, which it does not, it would be improper to combine such a teaching by Anderson with Danner to arrive at the presently claimed invention. As previously described, Danner teaches away from such a subsequent widening or thinning treatment step by teaching that one surface of the sheet is glazed or substantially hardened. Such a glass sheet having one side that is glazed or hardened cannot be widened or thinned as presently claimed.

Claim 1 as previously amended also claims a process that fusion forms and delivers a stream of glass having a viscosity of about 10 Pa.s to about 1000 Pa.s (100 poises to 10,000 poises) to the treatment device. It is respectfully submitted that Danner as combined with Anderson, fails to teach or suggest claim 1 as presently amended.

On page 7 of the Final Office Action, it is argued that:

"It is well established that in the art of processing (Kingery, pg 759) that for a typical soda-lime-silica glass.... ....in the working range the viscosity is higher, being 10^4 to 10^8 P. .... Since the treated sheet of glass (1a') is substantially but not completely hardened, **the Danner process is understood in the context of the Kingery disclosure to produce a treated stream accepted to exist in the "working range"... .... Of a viscosity of about 10^4 to 10^8 P** which reads on the claim of a viscosity of about 10^4 to 10^8 P." (Emphasis added)

First, the Applicant respectfully points out that that **the viscosity of the glass upon delivery to the treatment device according to the presently claimed invention is from about 10^2 to 10^4 poises (not 10^4 to 10^8 P), which is outside the range of about 10^4 to 10^8 P alleged by the Examiner to be taught by Danner in the context of Kingery.**

Second, the Examiner states that since **the treated sheet of glass (1a') is substantially but not completely hardened, the Danner process is understood in the context of the Kingery disclosure to produce <u>a treated stream</u> accepted to exist in the "working range"... .... of a viscosity of about 10^4 to 10^8 P.** To the contrary, the Applicant submits that the glass viscosity is already in the working range of about 10^4 to 10^8 P, not in the claimed range of 10^2 to 10^4 poises, prior to delivery to the impression roll. See Danner page 1, lines 19-23: the sheet "while in a soft or **formative stage** as evidenced by the fact that glass has contact at one side thereof with the figure surface of a roll." (Emphasis added) It is clear from this passage that the glass is already in the working range of 10^4 to 10^8, e.g. in the "formative stage," when delivered to the impression roll. The glass sheet must be in the working range of viscosity when delivered to the impression roll taught by Danner, so that that glass sheet can retain the configuration imparted to it by the impression roll. Also See Danner at:

page 1 lines 27-27 "to impart the desired figure formation to the sheet"; page 1 lines 32-35 "to perfectly shape itself to the roll configuration so that such configuration is sharply and clearly defined"; page 1 lines 64-65 "the softer side will easily take the impression of the mold"; page 2 lines 63-66 "the roll 10 is provided on its periphery with any configuration or impression which it may be

desire to impart to the side of the sheet"; page 2 lines 100-103 "In order to provide a surface of the sheet with well cut, clearly defined figures"; page 3 lines 27-30 "while the softer side will more readily take the impression of the roll"; and page 3 lines 70, 78, 87, 96, 103, 110, and 121; page 4 lines 1, 4-5, 17-18, 20, 35, 44-45, 50, 57-58, 67, 74, 82, 91-91, 104, 118, and 128; and page 5 lines 8-9, 18-19, 30-31 and 41.

On page 8 of the Final Rejection, the Examiner states that Danner fails to explicitly indicate a preferred viscosity of the stream of glass as delivered to the process. The Examiner goes on to state that (1) "Anderson presents a process wherein sheets of glass are delivered to a substrate with the goals of first conforming said sheets to a mold surface, (2) "Anderson indicates that the viscosity of the molten glass ribbon at delivery is between about 1000 to 5000 poise;" and (3) "it would be obvious "to deliver the sheets of glass in the Danner process in the same viscosity range as taught by Anderson to achieve a high fidelity impression." The Applicant respectfully traverses these points as follows.

As for assertion (1) above ("Anderson presents a process wherein sheets of glass are delivered to a substrate with the goal of first conforming said sheets to a mold surface"), the Examiner appears to be arguing that Anderson teaches a process for forming an imprint on the glass similar to Danner, and therefore it would have been obvious to one of skill in the art to combine Anderson with Danner in order to improve Danner's analogous process of imprinting a glass sheet. **It is respectfully submitted that Anderson does not teach a process that is at all similar to the Danner process.** Danner forms a glass sheet with a texture or pattern formed on or in **one surface** of the glass sheet. Anderson, on the other hand, teaches a process of forming a glass sheet into a "multiwell[ed] plate for use in biological or chemical laboratory applications." See Abstract of Anderson and see Fig. 2. A quick glace at Figure 2 clearly shows that during the Anderson process, **the entire glass sheet, e.g. both the front and back surfaces, is sucked into the cavities 30 in the mold** to form the glass sheet into a plate with a plurality of little bowl shapes or wells 34. After this step in Anderson, the glass sheet has no smooth side as in the Danner process, and has no face that presents a high surface quality as in the presently claimed invention. Anderson teaches a process that

radically deforms both surfaces of the glass sheet. The Anderson forms wells or cavities in one side of the plate that also protrude out the other side of the plate. **If one were to combine Danner with the Anderson, it is submitted that the resulting product would be a glass plate with two formed (or deformed) faces, and not a glass sheet having at least one of face presenting a high surface quality as is presently claimed in all of the pending claims.**

In light of the preceding comments, it is submitted that one of skill on the art would not have looked to the Anderson process as a means for improving the Danner process, because a sheet with a substantially hardened surface as taught by Danner cannot be drawn into the wells taught by Anderson and would make the Danner process inoperable. It is also submitted that one of skill in the art would not have looked to Anderson when seeking to improve or find solutions to issues they may be having when forming a flat glass sheet that has an impression on one surface thereof and a flat opposing surface as taught by Danner, because the Anderson process does not leave a smooth surface or face, but rather drastically deforms both surfaces. To combine Danner and Anderson is to ignore the differences between the teachings of the two references, and is a combination of non-analogous art arrived at through the impermissible use of hindsight. Anderson destroys the flatness of both sides of the sheet of glass, which is contrary to the teachings of Danner that provides one smooth surface and to the presently claimed invention that provides a face presenting a high surface quality.

As for the Examiner position (2) above, e.g. that "Anderson indicates that the viscosity of the molten glass ribbon at delivery is between about 1000 to 5000 poise" and that it would have been obvious to use glass with this viscosity in the Danner process. **As previously stated, the glass in Danner must be delivered to the impression roll with a viscosity in the working range, e.g. at a viscosity in the range of about 10^4 to 10^8,** so that the glass sheet is capably of receiving and maintaining the imprinted configuration from the impression roll. If the glass sheet were introduced to the impression roll with a viscosity between about 1000 to 5000 poise, it is submitted that the sheet would not effectively hold the configuration impressed into the glass by the impression roll and doing so would make the Danner process inoperable for forming imprinted figured glass.

The presently claimed invention places a first face (s2) into contact with **a substantially smooth surface of a treatment device or mechanism**, the Examiner continues to state that "in the absence of any evidence to the contrary, it is the Examiner's position that the prior art device [Danner] reads equally well upon treatment devices which are substantially textured or as well [on] devices which are substantially smooth." The Applicant repeats that this interpretation of Danner flies in that face of the teachings of Danner.

The Applicant again draws the Examiners attention at least to the following portions of Danner:

> page 1 lines 27-27 "**to impart the desired figure formation to the sheet**"; page 1 lines 32-35 "to perfectly shape itself to the roll configuration so that such **configuration is sharply and clearly defined**"; page 1 lines 64-65 "the softer side will easily **take the impression of the mold**"; page 2 lines 63-66 "the roll 10 is provided on its periphery with any **configuration or impression which it may be desire to impart to the side of the sheet**"; page 2 lines 100-103 "In order to provide a surface of the sheet with **well cut, clearly defined figures**"; page 3 lines 27-30 "while the softer side will more readily **take the impression of the roll**"; and also see page 3 lines 70, 78, 87, 96, 103, 110, and 121; page 4 lines 1, 4-5, 17-18, 20, 35, 44-45, 50, 57-58, 67, 74, 82, 91-91, 104, 118, and 128; and page 5 lines 8-9, 18-19, 30-31 and 41.)

From these and other portions of Danner, Danner is clearly directed to a method and apparatus for forming figured (e.g. a textured, not a smooth surface) glass, wherein **a glass sheet** b is pressed against and **takes the impression of the** non-smooth, **configured surface of an impression roll 10, in order to impress a desired** non-smooth **configuration** into the surface of the glass sheet. **Thus, the present invention's treatment device or mechanism (4a) that has a substantially smooth surface is not the same as Danner's impression roll 10 that has an <u>impression/configuration which is imparted to the glass sheet b</u>. A smooth treatment surface has no features that can be impressed into the surface of the glass and cannot be said to impart a configuration or impression to the glass.**

Accordingly, the Applicant respectfully submits that Danner does not disclose the invention of as presently claimed in independent Claim 1 and its associated dependent Claims.

The Applicant particularly draws the Examiner's attention to Danner page 1 lines 43-47, which state **"the sheet of glass flowing from the slab of directing member is preferably at a higher temperature when making configure glass than when making plain sheet glass." The Danner reference is clearly making a distinction between "plain sheet glass" that has two smooth surfaces and "configured glass' that, in Danner's words on page 2 lines 100-104 or page 1 lines 34-35, has "a surface of the sheet with <u>well cut, clearly defined figures</u>."** In view of this passage, there is no doubt that when Danner refers to "configured glass" or to a "configuration" or "impression" on the impression roll or in the treated glass, Danner means a surface on the impression roll or the treated glass that has a non-flat, non-planar, non-smooth pattern therein or thereon. The Applicant further draws the Examiner's attention to **Figure 2 of Danner, in which the surface of the impression roll is shown with a cross-hatched textured surface, not a smooth surface**. Looking at the cross-section line in Figure 1 of Danner, it can be seen that the roller is not shown in cross-section in Figure 2. Since the impression roll is not illustrated in cross-section in Figure 2, the cross-hatching on the impression roll in Figure 2 is clearly being used to indicate a non-smooth surface, not a cross-sectioned surface.

In view of the preceding arguments, it is submitted that claim 1 as previously amended, and therefore all of the pending claims (all of which depend from claim 1) are patentable over Danner as combined with Anderson under 35 USC 103, and that this rejection should be withdrawn.

Based upon the above remarks, and papers of records, applicant believes the pending claims of the above-captioned application are in allowable form and patentable over the prior art of record. Applicant respectfully requests that a timely Notice of Allowance be issued in this case.

Applicant believes that no extension of time is necessary to make this Reply timely. Should Applicant be in error, Applicant respectfully requests that the Office grant such time extension pursuant to 37 C.F.R. § 1.136(a) as necessary to make this Reply timely, and hereby authorizes the Office to charge any necessary fee or surcharge with respect to said time extension to the deposit account of the undersigned firm of attorneys, Deposit Account 03-3325.

Please direct any questions or comments to Bruce P Watson at 607-974-3378.

Regards,

DATE: December 4, 2008

Attorney for Assignee
Bruce P Watson
Reg. No. 35,405
Corning Incorporated
SP-TI-03-1
Corning, NY 14831
607-974-3378

CERTIFICATE OF MAILING OR TRANSMISSION

I hereby certify that this paper and/or fee or charge authorization is being transmitted to Mail Stop AF, Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450, via:

☒ the Electronic Filing System of the U.S. Patent and Trademark Office under 37 CFR §1.6(a)(4)

on December 4, 2008

Signature

Bruce P Watson